

BLENHEIM BRIDGE
National Covered Bridges Recording Project
Spanning Schoharie Creek, River Road (now bypassed)
North Blenheim
Schoharie County
New York

HAER NY-331
NY-331

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD

National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD

BLenheim BRIDGE

HAER No. NY-331

LOCATION: Spanning Schoharie Creek, River Road (now bypassed), North Blenheim,
Schoharie County, New York
UTM: 18.545902E.4702305N, Gilboar, NY Quadrangle

STRUCTURAL
TYPE: Wood covered bridge, Long truss with arch

DATE OF
CONSTRUCTION: 1855

DESIGNER/
BUILDER: Nichols M. Powers, Clarendon, Vermont

PRESENT OWNER: Schoharie County, New York

PREVIOUS USE: Vehicular bridge

PRESENT USE: Pedestrian bridge, bypassed in 1936

SIGNIFICANCE: The Blenheim Bridge has one of the longest clear spans of any surviving covered bridge in the world.¹ It is the only covered bridge with a single central arch, and one of only six surviving double-barrel covered bridges in the United States.²

HISTORIAN: Lola Bennett, 2002

PROJECT
INFORMATION: The National Covered Bridges Recording Project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. HAER is part of the Historic American Buildings

¹ Its rival, the Bridgeport Bridge (HAER No. CA-41) in Nevada County, California has a reported clear span of 210' on one side and 208' on the other. Blenheim's original truss seats do not exist, as the abutments were modified in 1972. Its original clear span is documented only as 210' (in the middle) on the 1936 HABS drawings. The present clear span (measured by Joseph Conwill in August 2003) is 199'-1", but measurements to the old stonework indicates clear spans of 209'-2" (upstream side) and 205'-6" (downstream side).

² According to covered bridge historian Joseph Conwill, there are presently six surviving double-barrel covered bridges in the United States: Pulp Mill and Shelburne in Vermont; Blenheim in New York; Philippi in West Virginia; Roberts in Ohio; and Ramp Creek in Indiana.

Survey/Historic American Engineering Record, a division of the National Park Service, U.S. Department of the Interior. The Federal Highway Administration funded the project.

For related documentation, see also HABS NY-359, "Blenheim Covered Bridge."

Chronology

- 1828—Act passed incorporating the Blenheim Bridge Company
- 1851—Tannery established at North Blenheim
- 1854—Nichols Powers comes to Schoharie to repair a covered bridge and is asked to build a covered bridge at North Blenheim
- 1855—Blenheim Bridge completed
- 1869—Spring freshet washes channel on western end of bridge; wooden approach span added
- 1871—Bridge sold to Moses Hubert of Blenheim for \$2,000
- 1887—Cattle crash through western approach; rebuilt as an iron truss approach span
- 1891—Bridge transferred to state ownership
- 1930—State makes plans to replace Blenheim Bridge and transfers ownership of bridge to Schoharie County Board of Supervisors at their request
- 1931—Schoharie County Board of Supervisors votes to maintain bridge as an historic relic
- 1932—Blenheim Bridge bypassed and the western approach span removed
- 1954—Schoharie County spends \$5,000 on bridge's eastern abutment and portal
- 1955—Blenheim Bridge 100th Anniversary celebration
- 1964—Blenheim Bridge designated a National Historic Landmark
- 1973—Graton Associates repairs Blenheim Bridge at a cost of \$2,920.00
- 1984—Blenheim Bridge designated a National Historic Civil Engineering Landmark
- 1997—Flood nearly destroys the bridge; Schoharie Dept. of Public Works hires Earth Tech Inc. to reinforce structure (repairs to trusses and lower chords)

Description

The Blenheim Bridge is a single-span, double-barrel modified Long truss wooden covered bridge with an auxiliary timber arch at its center resting on concrete-capped stone abutments.³ The total length of the bridge is 232'-0" and the clear span is 210'. The bridge is 24' high from the top of the deck to the ridge of the roof. It has a total width of 26'-3", each roadway measuring 10'-2" wide between the trusses. According to 1936 measured drawings by the Historic American Buildings Survey (HABS No. NY-359), the main framing timbers are of local white pine, the splices, shear blocks and prestressing wedges are of local white oak, the tie rods and bolts are wrought iron and the washers are cast iron.⁴

The truss is framed in the manner patented by Col. Stephen Harriman Long in 1830. The upper chord is four parallel lines of planks with wooden fish splices, bolted at each panel point and mid-panel point. The lower chord is four parallel lines of planks with wooden fish splices, bolted together in a similar manner. Paired timber posts (approximately 7 x 7"), forming twenty-two panels spaced 10'-0" on center, connect the upper and lower chords. There are paired timber braces (approximately 5 x 8") and single counter braces (approximately 4 1/2 x 8") between the posts. The dimensions of posts and braces decrease from the end of the trusses to the center of the span, proportioned to take into account differing member forces, thereby equalizing member stresses and producing an efficient structure. The posts pass through the lower chord where they are set into notches and fastened with 3/4" diameter bolts. The counter diagonals are notched into the upper and lower plies of the arch. There are wooden wedges in the joints between the bottom of the counterbraces and the posts. As prescribed in Colonel Long's patent, these wedges were used to prestress the truss when it was built.

The massive arch is in the same plane as the counterbraces of the central truss. It is composed of three plies of timber measuring 9 1/2 x 10 1/2", separated by spacer blocks. The timbers of each ply are spliced together, and the three plies are bolted together at the posts and braces. The arch springs from angled skewbacks on the abutments (originally stone, the skewbacks are now concrete). It rises approximately 30' to the ridge, and spans 210'. According to covered bridge builder Milton Graton, the arch is actually composed of different types of wood:

One-hundred years ago, a truly great designer and builder has thoughtfully made a transition from spruce arch timber to white oak where the arch passed through the floor to the stone work.⁵

Wooden floor beams (4 1/2 x 10") resting on the lower chord comprise the floor system. These beams support the wood plank deck. Lower lateral bracing is fastened between the lower chords, and tie rods have also been added at each panel point.

³ The abutment at the easterly end of the bridge was originally an abutment, but it became a pier in 1869 when a flood opened a channel and an approach had to be built.

⁴ Most sources state that the arch is oak; Graton, however, states that only the lower portions are oak, while the upper portion is pine.

⁵ Milton S. Graton to Mr. and Mrs. Grant A. Musser, November 12, 1970. Letter on file at Schoharie County Board of Public Works.

The upper lateral system consists of tie beams notched and bolted to the upper chord. There is upper lateral bracing between the tiebeams and sway braces between the posts and tiebeams. The rafters are notched to the outer ends of the tie beams and rise diagonally to the ridge of the gable roof. Galvanized steel fastened to purlins on top of the rafters covers the roof.

Board and batten siding (1 x 12" rough-sawn planks) covers the exterior of the bridge to about 2' below the upper chord. The sheathing is fastened to wooden nailers on the outer face of the truss. The portals are corbelled over the approaches and have peaked openings with triangular shelter panels.

The abutments are cut, squared stone with mortared joints. The lower chords of the bridge rest on a concrete cap on top of the facewall. The former approach span on the easterly end of the bridge was removed and the portal barricaded when the covered bridge was bypassed. There is a small picnic area at the westerly end of the bridge.

New York Covered Bridges

In Covered Bridges of the Northeast, bridge historian Richard Sanders Allen states that Theodore Burr "was the dominant figure of early bridge building in New York."⁶ In 1804, Burr built the first arch-truss wooden bridge in New York State across the Hudson at Waterford. Three years later, Maj. Salmon Wheat built New York's first covered bridge, a 160' double barrel structure with a single arch at Bridgeville. In 1811, Burr completed a covered bridge with three massive timber arches over Schoharie Creek at Esperance in Schoharie County. All of these bridges survived well into the twentieth century and could have influenced the design of the Blenheim Bridge, whose uniqueness apparently lies more in its massive scale than in the design itself.

At least 250 covered bridges are known to have existed in New York State.⁷ By 1942, floods, fires, and neglect had taken their toll and only forty-six covered bridges remained.⁸ According to the World Guide to Covered Bridges, today there are thirty-two surviving examples, with the majority located in and around the Catskills. Their dates range from a reported 1825 date to 1991, with more than half (53 percent) representing the period from 1850-1880. They represent many truss types, Town having the strongest representation with sixteen examples. There are only three examples of the Long truss, and this is the only one with an auxiliary arch.

Site History

In the late nineteenth century, Gen. Freegift Patchin built a gristmill near this site and established the hamlet of Patchin Hollow, now known as North Blenheim. In 1872, Hamilton Child described North Blenheim as follows:

⁶ Richard Sanders Allen, Covered Bridges of the Northeast (Brattleboro, VT: Stephen Greene Press, 1957), p.80.

⁷ Ibid.

⁸ Richard Sanders Allen, "New York State Covered Bridges," Highway Topics (December 1942).

North Blenheim, known also as Patchin Hollow, is situated on the west bank of Schoharie Creek, at the mouth of Westkill. It is divided into two parts by a steep hill that approaches so near the creek as to leave little room for more than a road. It contains two churches ... two school houses, two hotels, two stores, two wagon shops, two blacksmith shops, a harness shop, a shoemaker shop, a tailor shop, a paint shop, a grist mill, two saw mills and about fifty dwellings. There is a fine water power that is not at all improved. It is on the line of the Middleburgh and Gilboa stage. A steam sash and blind factory is near.⁹

On April 19, 1828, the New York State legislature incorporated the Blenheim Bridge Company, but no bridge was built for nearly thirty years.¹⁰ In 1850, Maj. Hezekiah Dickerman of Connecticut came to Blenheim and built a tannery on Schoharie Creek. The hemlock bark used for tannin was obtainable only on the opposite side of the creek, so in 1854, Mr. Dickerman, who had been elected to the town's Board of Supervisors and was a shareholder in the bridge company, decided it was finally time to build the bridge.¹¹

Construction of Blenheim Bridge

In 1854 Nichols Powers went to Schoharie, New York to repair a covered bridge and was asked to build a covered bridge at North Blenheim. A letter from George Martin, one of the directors, to Powers, reads as follows:

North Blenheim September 22, 1854

Mr. Powers

Dear Sir,

I have been informed that you are a bridge builder and have been expected at Schoharie Court House to repair a bridge but upon inquiry find that it is uncertain that you will be there, therefore write you concerning the building of a bridge at this place (Blenheim). We wish to build this fall and want to know if you can do the job. Will you please answer on receipt of this letter and let us know when you can come (if at all).

Yours truly, Geo. W. Martin

According to an article that appeared in the Schenectady Union-Star in 1930, the bridge was constructed "piece by piece back of the present Village of North Blenheim."¹² While the

⁹ Hamilton Child, Gazetteer and Business Directory of Schoharie County, N.Y. (Syracuse: Journal Office, 1872).

¹⁰ Most contemporary sources state that no bridge was built until 1857, but according to Mildred L. Bailey, "Blenheim Bridges," Schoharie County Historical Review (Fall-Winter 1980), p.21, there were at least two bridges built at or near this site prior to the present bridge. No historical documentary evidence has been found concerning this.

¹¹ When the first charter expired October 8, 1857, the Schoharie County Board of Supervisors extended it to thirty years.

¹² "Historic Blenheim Covered Bridge," Schenectady Union-Star, February 26, 1930.

carpenters were at work, the masons built the stone abutments. The bridge was then disassembled and re-erected across the river. Ninety-four thousand board feet (127 tons) of lumber, 3,600 pounds of bolts and 1,500 pounds of washers were used in its construction.¹³ Nichols Powers was paid \$7.00 a day (\$2,000 total) and the workmen received \$1.00 a day. They completed the bridge in 1855 at a cost of \$6,000.

Scoffers said that the bridge would fall of its own weight with the removal of the falsework. When the day came, Powers climbed to the roof and said, "If the bridge goes down, I never want to see the sun rise again!" People then said that the bridge would sag so much as to be useless. Powers replied that if this happened he would jump off. When the falsework was taken away the bridge settled only slightly, even less than Powers had calculated. The bridge opened to traffic as a privately-owned toll bridge.

Ownership of the Bridge

For many years, a toll-keeper lived in a small house adjacent to the bridge. Rates of toll were: footmen 1¢ and teams 12¢. After the Blenheim Bridge Company disbanded in the 1860s, Mr. Dickerman purchased the span and presented it to his daughter, Mrs. Charles Waite, of Jefferson County, New York. Waite's grandson came to Blenheim and collected the tolls from the bridge once a year. In 1871 Moses Hubert purchased the bridge for \$2,000. When his charter expired in 1891, the bridge came under the jurisdiction of the State of New York. When the state made plans to demolish the bridge in 1930 and erect a new span, residents petitioned the County Board of Supervisors. In 1931 the board voted to retain the bridge as an historic relic, and the state transferred ownership to the county.

Subsequent History of the Bridge

Schoharie Creek is usually 100' or less in width, but even a brief rain will cause the river to rise and the channel to widen from abutment to abutment. In 1869 a spring freshet washed a channel on the easterly end of bridge, necessitating construction of a wooden approach span. In 1891, the second approach span failed under the weight of a threshing machine. After many meetings and much discussion by the town board, members finally decided in 1894 to build a new iron approach span.

In 1973, covered bridge builder Milton Graton of Ashland, New Hampshire made extensive repairs to the bridge at a cost of \$2,920. In his book, The Last of the Covered Bridge Builders, Graton states that the bridge was "suffering from 'Covered Bridge Arthritis' at all bearing areas."¹⁴ The bridge had essentially settled at the westerly end because the timbers were rotting on the abutment. Concrete slabs were placed under the lower chords to the first vertical posts. Three feet of the ends of the arch were cut off and new thrust blocks constructed. The bridge was then resheathed.

¹³ James Dillon, National Register of Historic Places Inventory-Nomination Form: Old Blenheim Bridge, 1974.

¹⁴ Milton S. Graton, The Last of the Covered Bridge Builders (Plymouth, NH: Clifford-Nichol Inc., 1978), p.129.

Although it has been set on fire three times, struck by lightning, and threatened by flash floods, the Blenheim Bridge is still standing. Despite the heavy costs associated with maintaining the bridge, the people of Schoharie County are very fond of the structure, observe its milestone anniversaries, and use the bridge to promote tourism. At various times, individuals have made offers to purchase the bridge, one of the most recent being made in 1970 by Binghamton attorney Franklin B. Resseguie, who was establishing an exhibit on Hiawatha Island and thought that the move would make the bridge more accessible to visitors.¹⁵ The Schoharie County Board of Supervisors responded, “the bridge is not for sale at any price.”¹⁶

In 1964 the Blenheim Bridge was designated a National Historic Landmark; in 1974, it was listed on the National Register of Historic Places; and in 1984 it was designated as a National Historic Civil Engineering Landmark. The bridge was rehabilitated in 1997.

Nichols M. Powers¹⁷

Vermont’s best-known covered bridge builder was Nichols Montgomery Powers of Clarendon. Powers was born on August 30, 1817 in Pittsford, but spent most of his life in Clarendon. He apprenticed under Abraham Owen of Pittsford, and built his first covered bridge, a Town lattice truss over Furnace Brook at Pittsford Mills, at the age of twenty. His father Richard Powers had to sign the contract, and promise to make good any “spoiled timbers.” There were no “spoiled timbers,” and the bridge lasted until 1931, safely carrying a 20-ton steamroller during construction of its replacement.

Powers was active in bridge building between 1840 and 1880. He built many bridges in Vermont, but by the 1850s was taking on jobs in other states. His two most famous spans were constructed outside of Vermont: the Blenheim Bridge (1855) at North Blenheim, New York and an enormous railroad bridge (1866) near Perryville, Maryland. Although not formally educated, Powers was evidently gifted at mathematics and could do complicated calculations without writing them down. The Town lattice was his truss form of choice, but by the 1850s he was experimenting with models and new designs, such as the one he used at North Blenheim.

In addition to building bridges, Powers worked a large farm at his home in Clarendon and also had a cheese factory. He worked in other areas of industrial design, especially railroading, although little is known of this aspect of his career. He died on January 17, 1897, and is buried in Ira, Vermont.

¹⁵ Fanchon Dewell Cornell and Alicia Tara Cornell, *Blenheim History 1710-1991* (Albany: Fort Orange Press, 1994), p.76.

¹⁶ Martha T. Dayton, Chairman, Schoharie County Board of Supervisors, to Attorney Franklin B. Resseguie, March 5, 1970. Letter on file at the Schoharie County Board of Public Works.

¹⁷ For more on Nichols Powers, see HAER No. VT-28, “Brown Bridge.”

Bridge Design

Col. Stephen Harriman Long, designer of the Long truss, was born at Hopkinton, New Hampshire, December 30, 1784. He attended Dartmouth College, taught mathematics at West Point, and became an army engineer in 1814. From 1816 to 1827 he undertook numerous surveys for the U.S. Army Topographical Engineers. He surveyed sites for canals, explored the upper Mississippi River and led expeditions in the West. In 1827 the War Department assigned him to be a consulting engineer for the Baltimore & Ohio Railroad. It was during this time that Long became interested in the design and construction of bridges.

In 1830 he obtained a patent for a wooden truss bridge with diagonal compression members and vertical tension members, and received patents for variations on this design in 1836 and 1839. The Long truss is considered the first scientifically designed bridge truss type because the forces in the members were determined mathematically, where earlier bridge trusses had been designed by the empirical method. Early nineteenth century French engineer Navier noted that a parallel chord truss can be treated as a beam with a stiffness proportional to the area of the chords times the square of the distance between them. By using this analogy, Long was able to determine the required chord areas in the truss.¹⁸ The Long truss was a forerunner of iron panel-type trusses and one of the first to incorporate economy of design through the use of continuous framing over the piers.¹⁹

The Blenheim Bridge is consistent with Colonel Long's patent, except that the counterbrace wedges are at the bottom of the braces instead of the top, and there is a massive auxiliary arch between the two barrels. Many truss bridges were built with auxiliary arches in the nineteenth century, but the arches were usually paired on either side of the trusses. The Blenheim Bridge is unique in that not only does it have a single arch, but also it follows in the tradition of, and was presumably inspired by, the many Burr arch-truss covered bridges that were built in the Northeast in the early- to mid-nineteenth century.

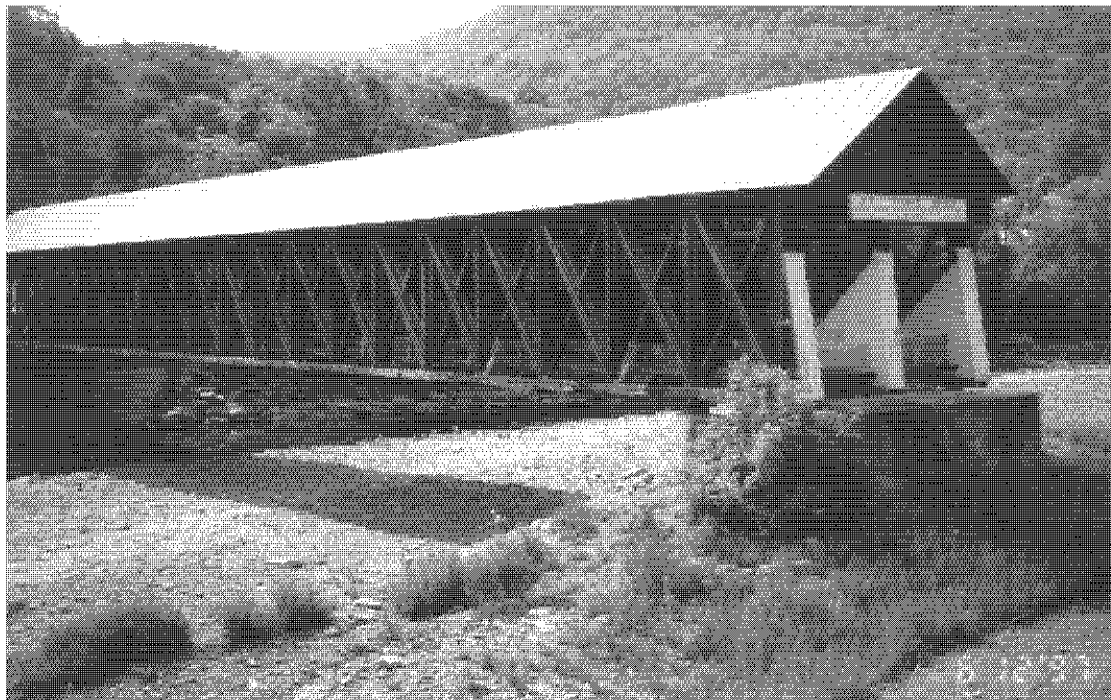
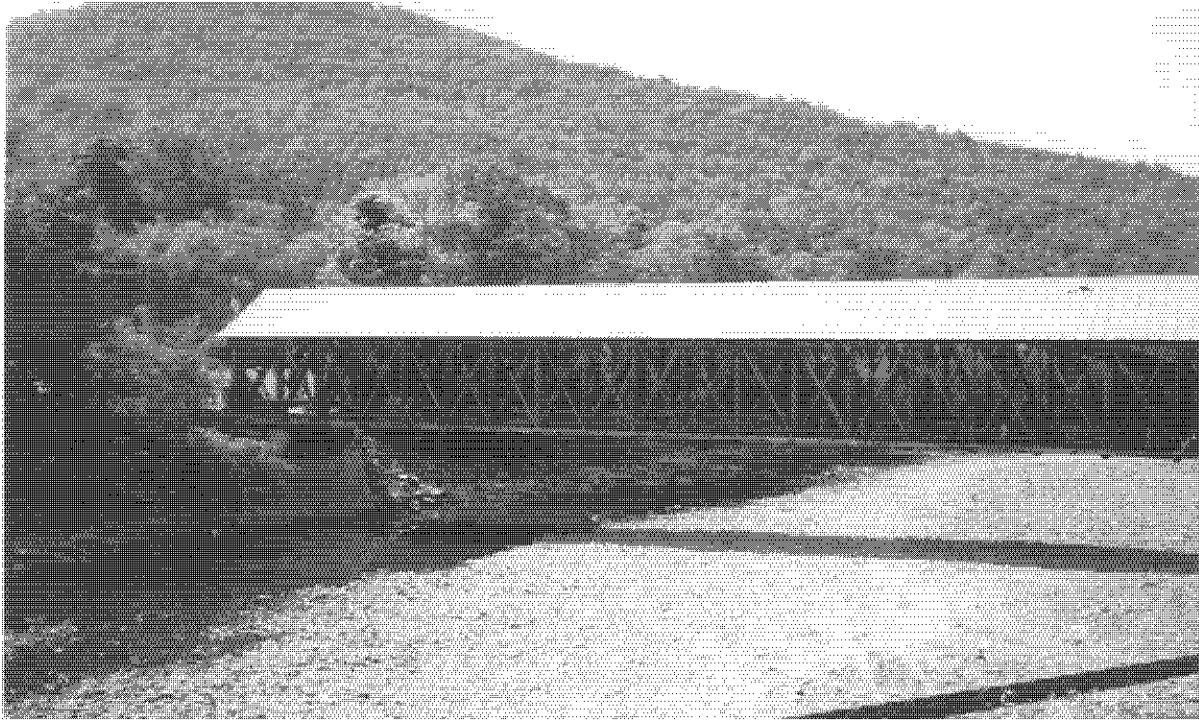
At 210', the Blenheim Bridge has the distinction of having the longest clear span of any surviving covered bridge in the world. However, at the time of its construction, there were numerous bridges having longer clear spans, some of the longest being Burr arch-trusses. Reportedly the longest single span covered bridge in the world was the McCall's Ferry Bridge over the Susquehanna River in Pennsylvania. Built by Theodore Burr in 1814-15, this bridge had a clear span of 360'. Although the McCall's Ferry Bridge was destroyed just three years later by an ice jam, there were numerous other long-span examples of arch-truss covered bridges in 1854 for Nicholas Powers to use as a basis for his design for the Blenheim Bridge.

¹⁸ D.A. Gasparini and C. Provost, "Contributions of Stephen Harriman Long to the Design of Trusses," 1987 CSCE Centennial Conference, Montreal.

¹⁹ John Diehl, "Bridge to the Past," Timeline [Ohio Historical Society] 15, no. 3 (May/June 1998): 36.

Appendix A, Photographs

The following photographs are of bridge repairs made after the flood of January 1997.
Photographs courtesy of Wayne M. Palmatier, Schoharie, New York.



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